

Over-breathing – How can it affect the voice?

A breathing specialist's perspective

by Tess Graham

Do your patients complain of being thirsty when they talk a lot or deliver a presentation? Are they bothered by mucus congestion, an irritable cough or a need to clear their throat repeatedly throughout a meeting, presentation or performance? Does talking leave them feeling tired? These problems can be indicators of an underlying breathing pattern disorder. The most common breathing pattern dysfunction is *over-breathing* and it has physical, physiological, psychological and biochemical consequences.

The perils of over-breathing

Over-breathing is excessive breathing. The *minute volume*, the amount of air passed through the upper airways and lungs in one minute, is greater than that needed to maintain good function and to preserve the optimum carbon dioxide/oxygen balance. The physical effects of high-volume breathing, especially, but not only, if via the mouth, include dehydration of the oral, nasal and vocal mucosa, inhalation of infective or irritant particles, and an increased negative/suction pressure on the walls of the pharynx (Bernoulli effect¹). The physiological response in the upper airway mucosa to over-breathing may include mucus production, inflammation and oedema (1). For someone with a baseline over-breathing pattern, speaking can exacerbate these effects, especially if they have a tendency to sharp, gasping inhales when taking a breath during speech.

In addition, to these local effects, by creating a deficit of carbon dioxide, over-breathing may set off a train of physiological reactions including reduced cellular oxygen uptake (depressed Bohr effect²)

¹ Bernoulli effect – the faster the flow (of air), the greater the partial vacuum or negative pressure created on the walls of the passage

² Bohr effect – the release of oxygen from the haemoglobin in the blood into the tissues is dependent on the level of carbon dioxide in the blood

smooth muscle spasm, muscle fatigue, narrowing of the blood vessels to the brain and heart, elevation of heart rate and activation of the autonomic nervous system into fight or flight mode (2,3). This is a positive reaction if the person is faced by a marauding tiger; not so positive if they are presenting to their biggest corporate client. A thumping heart, sweaty palms and armpits, dizziness, nausea, going 'weak at the knees' or even going blank are well-known components of stage fright that are in fact symptoms of over-breathing/hyperventilation and acute carbon dioxide deficit.

Recognising over-breathing

How can you tell if your patient is over-breathing? The signs of dysfunctional breathing can be subtle, but there are some give-away signs, including:

- breathing more than 12 - 14 breaths a minute
- audible breathing
- high *tidal volume*³ breathing - overly noticeable chest and/or abdominal expansion
- predominant upper-chest/clavicular movement
- shoulder lift on inhale
- mouth-breathing at any time
- frequent sighs and yawns, throat clearing, repetitive dry cough
- quick, gasping inhalations or breathlessness during speech

³ Normal resting tidal volume is 500ml (4) which is just 8-14% of lung capacity. A 500ml tidal breath is just visible as a small outward movement at the level of the solar plexus.

The prevalence of dysfunctional breathing

Today, over-breathing appears to be more common than normal breathing, and unfortunately accepted as normal. Minute volumes recorded in clinical trials for so called 'healthy normals' or 'controls' (5) can be double the physiological norm of 4-6 litres per minute (4,6) and what healthy adults breathed in the first half of the 1900s (7,8). Elevated tidal volume and/or respiratory rate result in an elevated minute volume. Nurses today may be taught that respiration rates up to 24 breaths per minute fall within the normal range whereas 8-12 is the normal of 20th century physiology texts (4).

People develop dysfunctional breathing habits for a variety of reasons. An elevation in breathing rate can, for example, be associated with chronic illness, chronic pain, a high sugar/high starch diet or high stress levels; mouth-breathing is associated with poor posture; upper-chest breathing is linked with the open-mouth posture. An 'over effort' to maintain a flat stomach or improve 'core stability' by consciously tensing the abdominal muscles may interfere with the movement of the diaphragm and potentially induce an upper-chest-breathing pattern.

People are generally unaware of their dysfunctional breathing habits. In fact it is a common belief that the larger the volume of air we breathe the better.

Checking someone's mode, rate, rhythm and volume of breathing are not part of standard medical health assessment or diagnosis. The effects of dysfunctional breathing can be insidious rather than overt.

Good breathing and good vocal technique are both crucial when someone is dependent upon their voice for their profession, whether a singer or speaker. More important than the lung capacity and the force and the volume of air, is the *control* of the air. Air passing through the vocal cords on the out-breath is the source of 'voice' and only a little air is needed to set them vibrating. Efficient breathing is a critical factor in relation to voice production; there is no advantage and considerable disadvantage in being a high-volume breather.

Australian opera singer Dame Nellie Melba wrote in her book *The Melba Method*, (9) “if only a little breath is necessary, it is obviously wise not to take too much air into the lungs”. The American singer Frank Sinatra had breath control that was legendary. You could not hear him take a breath, and it was hard to see it happen.

Breathing retraining

Breathing retraining is the process whereby dysfunctional breathing habits are identified then replaced by breathing that is at the correct rate, rhythm and volume, with correct posture and use of the breathing muscles. This is very different to breathing practices that focus on large tidal volume ‘deep’, ‘belly’ and ‘abdominal’ breathing. A breathing educator⁴ will instruct their client in how to maintain a physiologically normal breathing pattern with correct blood gas balance, at rest, when asleep, during activity, when exercising and during speech and singing. Breathing retraining should be applied until the improved breathing pattern is reconditioned and ‘second nature’. This can be a matter of days for some, weeks or months for others. However, noticeable improvement is usually evident within 24 hours.

In my clinical experience as a physiotherapist working specifically with breathing for over 20 years, I identified dysfunctional breathing patterns in many professional actors, singers and presenters. The problems they experienced included mucus congestion, dehydration, irritable cough, vocal strain and voice fatigue. Breathing retraining to correct their resting breathing pattern as well as training in breathing control and efficiency during speech, has been successful in eliminating irritable cough and post nasal drip as well as conferring greater vocal endurance and reducing the need for fluids during a performance. Efficient breathing also assists in maintaining calm in high-pressure situations.

⁴ Breathing educators may be skilled in different breathing retraining techniques. The Buteyko Method of Breathing Reconditioning is the best-known. The Alexander Technique is a wonderful method to assist with correct posture and body usage in order to facilitate correct breathing.

Normalisation of baseline breathing pattern can enhance voice work and have flow on effects beyond speech and performance. Improvement of breathing-related conditions like snoring, sleep apnoea, rhinitis, sinusitis, asthma and panic attacks is a logical consequence.

Some strategies to help an over-breather

- The best strategy a patient can adopt to improve their breathing is to treat their airway gently. Breathe gently, speak gently, and favour the nose for all breathing, including the in-breath during speech. As a therapist the crucial information to impart is that correct breathing is silent, small, slow, smooth, soft, and always nasal.
- It can be helpful to limit dairy products, alcohol, smoking, caffeine and sugary foods and drinks when working on breathing and especially before presenting as they can all increase breathing rate and bring on dehydration and phlegm.
- A patient should also cease practice of full-lung volume and forceful exhalation exercises unless a health practitioner has a scientific explanation for why it is important for them to continue to practice them.

To achieve a full return to a physiologically normal breathing pattern with all the benefits to the airway, voice and beyond will likely require a breathing retraining program with a skilled breathing educator. However considerable improvement in breathing and voice can occur from attention to the basic principles of healthy breathing.

My book, *Relief from Snoring and Sleep Apnoea*⁹ has a step-by-step guide to the breathing retraining process. While it is specifically written for people with sleep-breathing issues, the information and breathing retraining guidelines given there may also be of help to people with other breathing-related conditions. (Chapter 19 is about breathing control during speech and singing.)

Tess Graham is uniquely qualified to talk about breathing. She is a physiotherapist, breathing educator and the creator of the *BreatheAbility for Health programs* for organisations. Over a 20-year period she has delivered breathing retraining programs to thousands of people – with extraordinary and consistent success. She also presents breathing educator training courses for health professionals.

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